Wisconsin Geological
and Natural History Survey

I. C. 6344

SEPTEMBER, 1930

DEPARTMENT OF COMMERCE

UNITED STATES BUREAU OF MINES
SCOTT TURNER, DIRECTOR

INFORMATION CIRCULAR

WHAT THE MINE FOREMAN CAN DO TO PREVENT INJURY FROM FALLS OF ROOF IN COAL MINES

BY

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WHAT THE MINE FOREMAN CAN DO TO PREVENT INJURY FROM FALLS OF ROOF IN COAL MINES[1]

By J. W. Paul[2]

Mine foremen[3] are employed in coal mines for two reasons: First, so that the underground work may proceed in an orderly manner and that each employee gives attention to his duties; and second, by reason of the State law which requires the employment of such officials to see that the laws relating to safety are carried out. It may be seen that, with these two duties, the foreman has wide scope of authority and much responsibility.

As foreman of operations he has to meet certain economic questions that contribute to the cost of producing the coal, and as the agent of the State he must also supervise and coordinate the work in such manner as to insure that the employees work under safe conditions.

As the roof of coal mines is the source of the greatest hazard naturally the care of the roof must take much thought and planning on the part of the foreman; and this circular is therefore presented to call attention to some things he may do to prevent injury to the workmen by falls of the roof material or coal.

Mine foremen, in the principal coal-producing States, are certified by a State board which prescribes certain qualifications, experience, and character, attested by examination and personal endorsement. Certified foremen, therefore, are men who have had experience underground and know roof conditions and timbering methods.

The suggestions herein are based upon observations made at many mines and collectively embrace practices that have been found to be in effect and promoted by experienced mine foremen:

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1 - The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6344."

2 - Senior mining engineer, U. S. Bureau of Mines.

3 - The official recognized as being responsible for the execution of the State mining law and the operators' regulations relating to underground work is designated by most State laws as mine foreman, whereas in four others it is mine manager, mine boss, mining boss, and pit boss, respectively.

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1. The mine foreman should become familiar with the mining laws, particularly with respect to timbering, and note that in most instances the law requires that no workman shall be permitted to work in a dangerous or unsafe place.

2. The foreman is required by most of the laws to visit each working place every day or every alternate day when the mine is in operation; however, most practical foremen know that in some large mines this is a physical impossibility, and further, that to give proper supervision for operation and safety, working places should be visited during each working shift as many as two to four times.

3. The foreman should so group the working places that assistant foremen, face bosses, or supervisors will be assigned districts embracing 25 to 30 workmen, so the official may have ample time to visit each workman three or four times each shift to instruct him and see that he is testing and timbering his roof properly.

4. As an aid in laying out the districts the foreman should personally travel each district to determine the time required to examine the roof and the timber and to give instructions to the workmen.

5. There are three things of primary importance to which the foreman must give his attention, (a) studying the roof and the nature of the material that is liable to fall, (b) studying the best method for testing the roof to determine its soundness and safety, and (c) devising a system of timbering that gives the greatest assurance against the roof falling in those parts of the mine where men work or travel.

6. The foreman will find helpful suggestions in conducting a study of the roof if he enlists the services of the assistant foreman, the mining engineer of the company, and several good miners, and conducts the study in their presence.

7. The foreman should test both solid and loose roof with iron rods and with the miner's pick, using the vibration[4] method to determine which gives the better result. In all cases studied, the iron rod has been found to be most reliable, and this should be demonstrated by the foreman to the satisfaction of the officials and miners.

8. The foreman, all assistants, fire bosses, and face bosses should carry a roof-testing rod at all times while on duty in the mine. The length of the rod will be determined by the heighth of the roof to be tested.

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4 - The vibration method of testing the roof of a mine consists of placing the bare fingers of one hand against the roof material to be tested and at the same time striking this material with an iron rod, a pick, or other suitable tool held in the other hand. The vibration felt in the fingers held against the roof will give an indication of the soundness or looseness of the material.

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9. The foreman, with the advice of the State mine inspector, the mining engineer, assistant foreman, and some good miners should adopt a system or schedule of timbering for each roof condition in the mine and rules for carrying out these regulations.

10. The foreman should prepare sketches showing the relative position of the timber with respect to the track, the face, and rib; furnish each assistant, face boss, and fire boss with a copy and post copies where the miners may see them.

11. The foreman should direct the assistant foreman and face bosses to instruct the miners in the method of timbering adopted and insist upon its strict compliance, and the placing of any additional timber needed for making the roof safe, as may be determined by the miner, the assistant, or the face boss.

12. The foreman should adopt a schedule or systematic roof testing which, if followed, will prevent many accidents. In the first place, as previously stated, he and all supervising officials should be provided with testing rods which they should carry always when on duty in the mine. The miner should be required to test his roof at the beginning of the shift and at intervals of not more than an hour during the shift, also upon the approach of any visitor. The supervising official when visiting a working place should first observe how thoroughly the miner tests the roof; then he should make the tests for his own satisfaction, examine the timbering, and give any needed instructions. The vibration method of roof testing should be followed strictly.

13. In mechanized mining the foreman has new conditions to meet with respect to roof support. Where scraper loaders are in use there is a long and variable width of roof where props can not be placed, since they would be in the way of the scraper. The foreman should therefore use timber or steel in the form of a cantilever; two props supporting a timber or steel beam with the free end extended to the coal face will give added protection to the men engaged in undercutting, blasting, and guiding the scraper. Where there is danger of the roof breaking the props the foreman should give consideration to the use of cribs which may be moved forward as the coal face advances.

Shaker conveyors, flight conveyors, and belt conveyors admit of systematic placing of timber near the face of the coal before it is shot down, and the foreman should see that this is promptly done.

Loading machines require a certain amount of clearance for their proper operation and should be used only where roof conditions permit the necessary precautions against roof hazards to the men and the machine. The foreman should delegate to a timber man the duty of testing the roof and placing any timber to insure protection against insecure roof.

All men employed in mechanized mining should be instructed by the foreman how to test the roof by the vibration method and be required to make the

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test at frequent intervals by this method, since the sound method of testing is of no value in the presence of the noise of machinery.

14. Discipline and penalties.- Under the laws of many of the mining States a penalty is provided for mine foremen who neglect their duties as prescribed by law when such neglect results in injury or death or a condition that admits of an impending danger; in some States this also applies to the employees. Rules and regulations for timbering and the proper care of the roof must have some penalty specified or implied, and in the implied penalty the management or mine foreman may have a range extending from a reprimand or a definite number of days of lay-off to ultimate discharge. Such penalties must be applied with fairness to maintain discipline and cooperation.

15. Having adopted timber regulations and a schedule of roof testing the foreman must have some method of ascertaining wherein thefe is any violation or neglect to comply with these, and to act intelligently upon such cases he should make it a matter of record. All foremen and supervisory officials should carry notebooks in which they should record the name or check number of any employee found disregarding the regulations.

16. Printed cards about 2-1/2 by 4-1/2 inches, bound in book form, are convenient for the face boss or foreman to carry, and as violations are observed a cross mark in the appropriate square on the card would indicate the nature of the violation. The end of the card may be detached along the perforation and given to the employee. The employee will then be required to see the mine foreman before returning to work and receive his comments or disciplinary action. The following is a form of card record suitable for such use:

Date_____ Hr._____ Mine_____

Check No._____ Room No._____

Entry_____

A.	Timber too far from the coal face	( )
B.	Working under loose roof	( )
C.	Loose roof not taken down	( )
D.	Timber regulations neglected	( )
E.	Props insecurely set	( )
F.	Interval between posts too great	( )
G.	Insufficient cap pieces	( )
H.	Safety post not set up	( )
I.	Took employee out of his place	( )

Did you remain until place was made safe: Yes____ No____

Signature of official_____

:Date_____

:Check No._____

: SEE THE MINE
: FOREMAN
: BEFORE
: RETURNING
: TO WORK.
:Regulations neglected.
:(Indicate by letter
:_____
:_____

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The use of this type of card will furnish a record of those who may be careless or indifferent to regulations, and when repeated violations occur it may develop that the employee had better be given different employment where he will be less liable to injury.

17. When a miner is found working under unsafe roof by the foreman, or assistant, the latter should either remain to see the place made safe or he should take the miner out of his working place until he can send a responsible person to help make the place safe. This is the requirement of some State mining laws and is practiced at some mines where it is not required by the law.

18. The foreman should endeavor to gain the confidence of the employees by requesting them to suggest betterments in mining, blasting, and timbering, and thus make them feel that their suggestions are helpful and of much value.

19. As blasting is a part of the miner's duty in many mines, the foreman should make a study of the placing of the shots and gage the quantity of explosive in such manner as to do the least damage to the roof.

20. The foreman should require the roof to be timbered within a minimum distance from the face before the coal is blasted, and where shotfirers are employed they should be instructed not to fire any shots where the place is not timbered according to the regulations or instructions.

21. The advisability of using safety posts[5] while the miner is loading coal should be given consideration by the foreman, because in most cases they give added safety.

22. The coal ribs along entries and in rooms should be kept straight, and the foreman should see that the machine men are instructed to not gouge the rib when undercutting, because such gouging makes the working place irregular in width and interferes with systematic timbering.

23. Some coal has irregular slip planes, and the coal is liable to fall away from the face or rib; where this condition exists the foreman should

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5 - As distinguished from a permanent post, a safety post is one that is placed temporarily for the protection of the workman at his immediate working locality, and either holds the roof or gives warning of movement of the roof. Safety posts are used mostly near the working face while the miner is loading coal and the number of such posts and the space between them depends upon the nature of the roof and its liability to fall, if not supported.

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make sure that the miners and others who work at the face make use of sprags or leaners[6] to prevent the coal from falling.

24. In pitching coal beds the coal is liable to fall away from the face in places going to the rise. The foreman should see that sprags are used to protect the miner from coal that may fall away from the face.

25. After shots have been fired, the coal at the face often remains standing, and after part of it has been loaded some part of the remaining standing coal is liable to roll away suddenly and injure the miner. To prevent such an occurrence the foreman should require miners to place sprags or leaners against the loose standing coal.

26. Some coals when undercut tend to drop and disengage pieces of coal that roll out and endanger the machine men or miner; this danger is accentuated when the coal is snubbed, therefore the foreman should require the use of sprags or leaners where such danger is apparent. When setting posts near coal that is liable to roll out it is an advantage to place the wedge on the prop with the smaller end of the wedge pointing toward the coal, because the prop is less liable to be knocked down if struck by rolling coal. A number of miners have been killed by being struck by props that were set insecurely and knocked out by coal rolling away from the face or rib.

27. The foreman should give special attention to machine operators respecting their removing or knocking out props near the face to make space for the cutting machine. If it is necessary to remove a prop to make room for the machine the roof should be carefully tested; when unsound a collar or cross bar should be placed to span the place where the prop stood before its removal, and before leaving the place the prop should be replaced and the collar or cross-bar also left in place. If a machine in moving should knock down a prop, the prop should be immediately reset by the machine operators.

28. The condition of the haulage track with respect to the liability of cars being derailed should be considered by the foreman where posts are set away from the rib, because they are liable to be knocked out by a derailed car and cause the roof to fall. One remedy is to maintain good track; another is to recess the posts in the coal rib.

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6 - Sprags and leaners are used to stop or prevent movement. In connection with coal mining, a sprag or leaner consists of a supporting member, usually a timber such as a mine prop, set with one end resting in a recess in the floor and the other end in a recess in the coal, and inclined at about 30 to 45 degrees with the floor. Another form of a sprag is the use of a block of wood placed in the undermined coal securely wedged in place.

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29. The foreman should keep tab on all pillar work to make sure that the break line is kept straight and each working place is "in step," thus insuring uniform subsidence of the roof material. Irregular break lines or two break lines meeting in an acute angle often result in the concentration of excessive weight on the pillars and bring about breaks in the roof which add to the roof hazard in pillar extraction.

30. Where there are cleats or slip planes in the roof the foreman should instruct the miners and timbermen when setting timber always to place the cap across the cleat or slip plane.

31. While the miner is engaged in making caps and wedges he is not loading coal, therefore when the foreman desires to obtain the maximum tonnage it will be to his interest to furnish caps and wedges ready for use; at the same time the timber, caps, and wedges will give better service.

32. Much timber may be saved and its usefulness extended if the foreman sees that substantial cap pieces are used on all posts, particularly in mines where pillar extraction is conducted or where the floor heaves.

33. Where head coal is left up on the advance and taken down on the retreat the foreman should see that as the head or top coal is removed sufficient props are placed under the brow of the coal to give protection while the fallen coal is being loaded and while the head coal is being blasted or pulled down. Rows of props set from the brow outby for 10 or 15 feet give added protection.

34. One of the greatest dangers is the withdrawal of posts, because when a post is removed some of the roof is liable to fall immediately. The foreman should provide mechanical post pullers and make sure they are always used by men specially selected for this work, and a severe penalty should be provided for the practice of knocking props out with an axe or sledge.

35. In timbering high cavities, where a timber crew is employed, the foreman should see that an experienced assistant foreman is detailed to be present while the work is in progress, if the foreman himself can not be present.

36. Fire bosses, in some localities termed gas watchmen or mine examiners, and shotfirers should be required by the foreman to place danger signs approaching any place when they find loose or dangerous roof, and they should report this to the foreman or his assistant.

37. When an accident occurs from a fall of the roof or coal it brings up the question as to whether the regulations are sufficient, if the regulations were disregarded, or if the supervision was inadequate. The foreman should insist upon thorough investigation of the circumstances to bring out all the facts and conditions to determine wherein the regulations are lacking, if the supervision was at fault, and if the mining method was in any way responsible, and determine what may be done to prevent a similar accident. A written record should be made with sketches of the place showing definite measurements.

38. The foreman must not lose sight of the fact that he is accountable to both the State and his company for seeing that the miners and other underground employees are instructed in their duties and are shown how to conduct their work with the greatest degree of safety, in accordance with the State laws and company regulations.

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